

In Lesson 3-3, you learned that parallel lines have the same slope. You can use the slopes of lines to prove that lines are parallel.

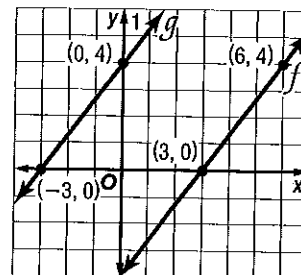
Example 4 Slope and Parallel Lines

Determine whether $g \parallel f$.

$$\text{slope of } f: m = \frac{4 - 0}{6 - 3} \text{ or } \frac{4}{3}$$

$$\text{slope of } g: m = \frac{4 - 0}{0 - (-3)} \text{ or } \frac{4}{3}$$

Since the slopes are the same, $g \parallel f$.



Check for Understanding

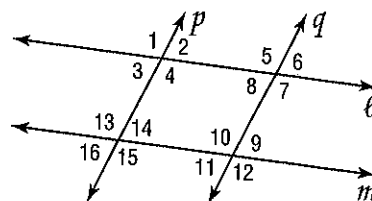
Concept Check

- Summarize five different methods to prove that two lines are parallel.
- Find a counterexample for the following statement.
If lines ℓ and m are cut by transversal t so that consecutive interior angles are congruent, then lines ℓ and m are parallel and t is perpendicular to both lines.
- OPEN ENDED** Describe two situations in your own life in which you encounter parallel lines. How could you verify that the lines are parallel?

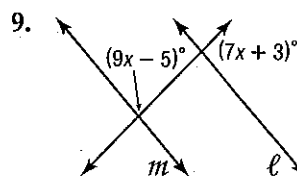
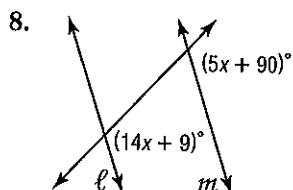
Guided Practice

Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.

- $\angle 16 \cong \angle 3$
- $\angle 4 \cong \angle 13$
- $m\angle 14 + m\angle 10 = 180$
- $\angle 1 \cong \angle 7$

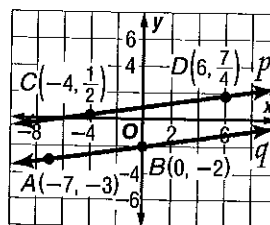


Find x so that $\ell \parallel m$.



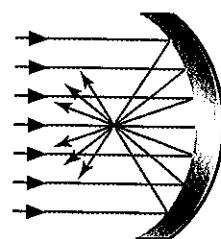
10. **PROOF** Write a two-column proof of Theorem 3.5.

11. Determine whether $p \parallel q$.



Application

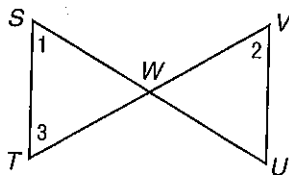
12. **PHYSICS** The Hubble Telescope gathers parallel light rays and directs them to a central focal point. Use a protractor to measure several of the angles shown in the diagram. Are the lines parallel? Explain how you know.



PROOF Write a two-column proof for each of the following.

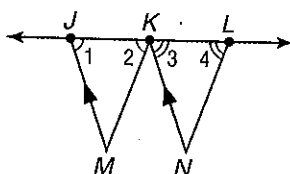
34. Given: $\angle 2 \cong \angle 1$
 $\angle 1 \cong \angle 3$

Prove: $\overline{ST} \parallel \overline{UV}$



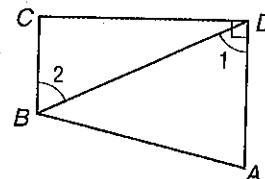
36. Given: $\overline{JM} \parallel \overline{KN}$
 $\angle 1 \cong \angle 2$
 $\angle 3 \cong \angle 4$

Prove: $\overline{KM} \parallel \overline{LN}$



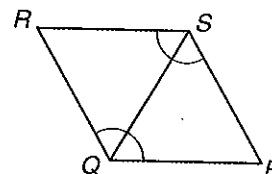
35. Given: $\overline{AD} \perp \overline{CD}$
 $\angle 1 \cong \angle 2$

Prove: $\overline{BC} \perp \overline{CD}$

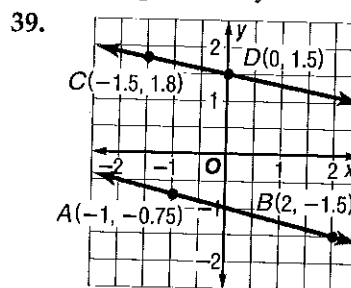
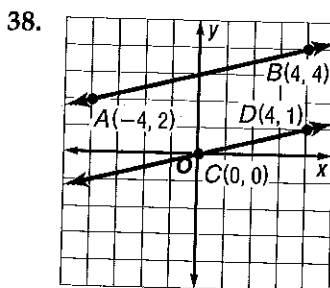


37. Given: $\angle RSP \cong \angle PQR$
 $\angle QRS$ and $\angle PQR$ are supplementary.

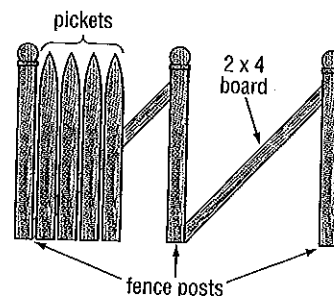
Prove: $\overline{PS} \parallel \overline{QR}$



Determine whether each pair of lines is parallel. Explain why or why not.

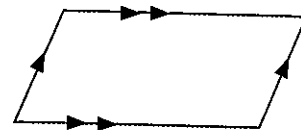


40. **HOME IMPROVEMENT** To build a fence, Jim positioned the fence posts and then placed a 2×4 board at an angle between the fence posts. As he placed each picket, he measured the angle that the picket made with the 2×4 . Why does this ensure that the pickets will be parallel?



41. **FOOTBALL** When striping the practice football field, Mr. Hawkinson first painted the sidelines. Next he marked off 10-yard increments on one sideline. He then constructed lines perpendicular to the sidelines at each 10-yard mark. Why does this guarantee that the 10-yard lines will be parallel?

42. **CRITICAL THINKING** When Adeel was working on an art project, he drew a four-sided figure with two pairs of opposite parallel sides. He noticed some patterns relating to the angles in the figure. List as many patterns as you can about a 4-sided figure with two pairs of opposite parallel sides.



43. **RESEARCH** Use the Internet or other resource to find mathematicians like John Playfair who discovered new concepts and proved new theorems related to parallel lines. Briefly describe their discoveries.

More About...



John Playfair

In 1795, John Playfair published his version of Euclid's *Elements*. In his edition, Playfair standardized the notation used for points and figures and introduced algebraic notation for use in proofs.

Source: mathworld.wolfram.com